

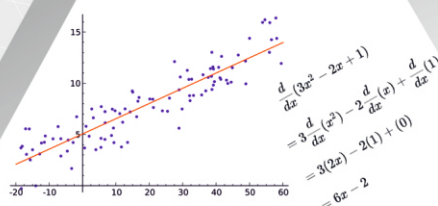
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Business Statistics

Business Mathematics

5th Revised Edition



SULTAN CHAND & SONS

Business Statistics and Business Mathematics

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Preface



This book has been designed primarily for the students of B.Com., 2nd year (Paper VI) of Delhi University and other Universities having similar syllabi and also BBA, B.Com.

The main features of this book are :

- The matter has been presented in a very simple and lucid style and is self-explanatory.
- There are more than 270 solved illustrations in the section relating to Business Statistics.
- There are more than 500 solved examples to explain various mathematical techniques.
- Latest examination question papers upto 2019 have been covered either as Illustrations or in Try Yourself questions /Exercises.
- Special care has been taken to develop the topics of Mathematics in an easy to understand form.
- Each mathematical concept is illustrated with solved examples which have been designed to clarify the principles involved.
- The basics and solved examples are followed by an exercise for self practice.
- At the end of each chapter, review exercise is given based on various concepts dealt within the chapter.
- Unsolved problems are given in the form of exercises followed by their answers.
- At the end of each chapter a quick review of the concepts discussed in the chapter are presented.

We strongly believe that the road to improvement is never ending. We shall look forward and gratefully acknowledge all suggestions received to make this text more useful.

AUTHORS

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3.	Graphic Presentation	36	43	6	7	6	BS-3.1-3.43
4.	Measures of Central Tendency	65	59	8	9	9	BS-4.1-4.80
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Illustrative Examples.....	BM-4.4
Methods of Integration.....	BM-4.7
Integration by Substitution (Change of Variable).....	BM-4.7
Integration by Parts.....	BM-4.7
Integration by Partial Fractions.....	BM-4.8
Some Standard Integrals.....	BM-4.13
Definite Integral.....	BM-4.20
Rules of Integration.....	BM-4.21
Applications to Business and Economics.....	BM-4.26
Finding of Cost Function and Average Cost Function.....	BM-4.26
Finding of Revenue Function and Demand Function.....	BM-4.31
Finding Maximum Profit Marginal Revenue and Marginal Cost Functions.....	BM-4.34
Finding Consumption Function, when the Marginal Propensity to Consume is given.....	BM-4.38
Finding Demand Function, when Price Elasticity of Demand is Given.....	BM-4.39
Finding Sales of the Product.....	BM-4.41
Consumer's and Producer's Surplus.....	BM-4.44
Review Exercise.....	BM-4.49
Review of the Chapter.....	BM-4.50

5. MATHEMATICS OF FINANCE

BM-5.1-5.50

Simple Interest.....	BM-5.1
Compound Interest.....	BM-5.4
Continuously Compounded Interest.....	BM-5.13
Nominal and Effective Rates of Interest.....	BM-5.16
Relationship between the Effective Rate and the Nominal Rate.....	BM-5.17
Present Value.....	BM-5.20
Nominal Rate of Discount, Effective Rate of Discount and Force of Discount.....	BM-5.22
Depreciation.....	BM-5.24
Determination of Equivalent Values.....	BM-5.28
Annuities.....	BM-5.30
Ordinary Annuity.....	BM-5.30
Annuity Due.....	BM-5.35
Deferred Annuity.....	BM-5.38
Perpetuity.....	BM-5.40
Sinking Fund.....	BM-5.40
Valuation of Loans and Debentures.....	BM-5.42
Loan.....	BM-5.42
Debentures.....	BM-5.43
Review Exercise.....	BM-5.47
Review of the Chapter.....	BM-5.48

APPENDIX

BM-A.1-A.4

Syllabus



University of Delhi
B.Com. Semester II

Paper 2.3: Business Mathematics and Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Part A: Business Mathematics		
(a) Matrices: Definition of a matrix. Types of matrices. Algebra of matrices. Applications of matrices operations for solution to simple business and economic problems. Calculation of values of determinants up to third order. Finding inverse of a matrix through determinant method. Solution of system of linear equation up to three variables.	BM	1
(b) Differential Calculus: Mathematical functions and their types— linear, quadratic, polynomial. Concepts of limit and continuity of a function. Concept of differentiation. Rules of differentiation—simple standard forms. Applications of differentiation— elasticity of demand and supply. Maxima and Minima of functions (involving second or third order derivatives) relating to cost, revenue and profit.	BM	3
(c) Basic Mathematics of Finance: Simple and compound interest. Rates of interest—nominal, effective and continuous—and their inter-relationships. Compounding and discounting of a sum using different types of rates.	BM	5
Part B: Business Statistics		
Unit I: Uni-variate Analysis		
(a) Measures of Central Tendency: Arithmetic mean, Geometric mean and Harmonic mean: properties and applications; Median and other Partition values (quartiles, deciles, percentiles), Mode.	BS	4, 5
(b) Measures of Dispersion: Absolute and relative-Range, Quartile deviation Mean deviation, Standard deviation and their coefficient; Properties of Standard deviation/Variance.	BS	5
Unit II: Bi-variate Analysis		
(a) Simple and Linear Correlation Analysis: Meaning, measurement (Karl Pearson's Co-efficient and Spearman's rank correlation) and Properties.	BS	6
(b) Simple and Linear Regression Analysis: Regression equations and estimation, properties of Regression coefficients; Relationship between correlation and regression.	BS	7
Unit III: Index Numbers		
(a) Meaning and uses: Construction of index numbers: Aggregatives and average of relatives—simple and weighted; Tests of adequacy of index numbers; Computation and uses of Consumers Price Index (CPI).	BS	8
Unit IV: Time Series		
Components; additive and multiplicative models; Trend analysis—moving averages and method of least squares (linear trend).	BS	9

School of Open Learning, University of Delhi

B.Com. : II Year, Part II : Examination 2019

Paper VI: Business Mathematics and Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Part A: Business Mathematics		
Unit I: Matrices and Determinants		
1.1 Definition of a matrix. Types of matrices. Algebra of matrices.	BM	1
1.2 Calculation of values of determinants upto third order, Adjoint of a matrix. Elementary row operations. Finding inverse of a matrix through adjoint and elementary row operations. Applications of matrices for solution to simple business and economic problems.	BM	1
Unit II: Calculus		
2.1 Mathematical functions and their types—linear, quadratic, polynomial, exponential and logarithmic. Concepts of limit, and continuity of a function.	BM	3
2.2 Concept of differentiation. Rules of differentiation—simple standard forms (involving one variable).	BM	3
2.3 Applications of differentiation—elasticities of demand and supply. Maxima and minima of functions (involving second or third order derivatives) relating to cost and revenue.	BM	3
2.4 Integration and its applications to business and economic situations.	BM	4
Unit III: Basic Mathematics of Finance		
3.1 Simple and compound interest. Rates of interest—nominal, effective and continuous and their inter-relationships. Compounding and discounting of a sum using different types of rates.	BM	5
Part B: Business Statistics		
Unit I: Descriptive Statistics for Univariate Data		
1.1 Introduction to statistics. Preparation of frequency distributions including graphic presentations.	BS	1
1.2 Measures of Central Tendency	BS	4
(a) Mathematical Averages: Arithmetic mean. Geometric mean and Harmonic mean: properties and applications.		
(b) Positional Averages: Mode and median and other partition values—quartiles, deciles, and percentiles (including graphic determination).		
1.3 Measures of Variation: absolute and relative. Range, quartile deviation, mean deviation, standard deviation, and variance.	BS	5
Unit II: Correlation and Regression Analysis		
2.1 Correlation: Meaning, Correlation using scatter diagram. Karl Pearson's co-efficient of correlation: calculation and properties.	BS	6
2.2 Regression Analysis: Linear regression defined. Regression equations and estimation.	BS	7
Unit III: Index Numbers		
3.1 Meaning and uses of index numbers. Construction of index numbers: fixed and chain base; univariate and composite. Aggregative and average of relatives—simple and weighted. Tests of adequacy of index numbers. Construction of consumer price indices.	BS	8
Unit IV: Time Series Analysis		
4.1 Components of time series, additive and multiplicative models.	BS	9
4.2 Trend analysis. Finding trend by moving average method, Fitting of linear trend line using principle of least squares.	BS	9

Jodhpur University
B.Com. : Semester II (CBCS)
Paper BC 2.3: Business Mathematics and Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Part A: Business Mathematics		
Unit I: Matrices		
Definition of a matrix. Types of matrices; Algebra of matrices. Calculation of values of determinants up to third order; Adjoint of a matrix; Finding inverse of a matrix through adjoint; Applications of matrices to solution of simple business and economic problems.	BM	1
Unit 2: Differential Calculus		
Mathematical functions and their types—linear, quadratic, polynomial; Concepts of limit and continuity of a function; Concept of differentiation; Rules of differentiation—simple standard forms. Applications of differentiation—elasticity of demand and supply; Maxima and Minima of functions (involving second or third order derivatives) relating to cost, revenue and profit.	BM	3
Unit 3: Basic Mathematics of Finance		
Simple and compound interest Rates of interest—nominal, effective and continuous—their inter-relationships; Compounding and discounting of a sum using different types of rates.	BM	5
Part B: Business Statistics		
Unit 1: Uni-variate Analysis		
Measures of Central Tendency including arithmetic mean, geometric mean and harmonic mean: properties and applications; mode and median. Partition values—quartiles, deciles, and percentiles. Measures of Variation: absolute and relative. Range, quartile deviation and mean deviation; Variance and Standard deviation: calculation and properties.	BS	1, 4, 5
Unit 2: Bi-variate Analysis		
Simple Linear Correlation Analysis: Meaning, and measurement, Karl Pearson's co-efficient and Spearman's rank correlation.	BS	6
Simple Linear Regression Analysis: Regression equations and estimation. Relationship between correlation and regression coefficients.	BS	7
Unit 3: Time-based Data: Index Numbers and Time-Series Analysis		
Meaning and uses of index numbers; Construction of index numbers: Aggregative and average of relatives—simple and weighted, Tests of adequacy of index numbers, Construction of consumer price indices.	BS	8
Components of time series; additive and multiplicative models; Trend analysis: Finding trend by moving average method and Fitting of linear trend line using principle of least squares.	BS	9

Bundelkhand University, Jhansi (U.P.)
B.Com. (Hons.) 2015-16 Onwards
Semester IV: Business Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit I: Statistical Data and Descriptive Statistics		
1.1 Measures of Central Tendency (a) Mathematical averages including arithmetic mean, geometric and harmonic mean, properties and applications. (b) Positional Averages: Mode, Median (and other partition values including quartiles, deciles, and percentiles).	BS	4
1.2 Measures of Variation: absolute and relative. Range, quartile deviation, mean deviation, standard deviation, and their coefficient, Properties of standard deviation/variance.	BS	5
1.3 Moments: calculation and significance. Skewness, Kurtosis and Moments		
Unit II: Probability, Probability Distributions and Decision Theory		
2.1 Theory of Probability. Approaches to the calculation of probability.		
2.2 Calculation of event probabilities. Addition and multiplication laws of probability.		
2.3 Probability distributions: Binomial, Poisson and Normal Distribution.		
Unit III: Simple Correlation and Regression Analysis		
3.1 Correlation Analysis. Meaning of Correlation: simple, multiple and partial; linear and non-linear, Causation and correlation, Scatter diagram, Pearson's co-efficient of correlation; Probable and standard errors, Rank Correlation.	BS	6
3.2 Regression Analysis. Principle of least squares and regression lines, Regression equations and estimation; Standard Error of Estimates.	BS	7
Unit IV: Index Numbers		
4.1 Meaning and uses of index numbers. Construction of index numbers: fixed and chain base; uni-variate and composite: Aggregative and average of relatives—simple and weighted.	BS	8
4.2 Test of adequacy of index numbers. Base shifting, splicing and deflating. Problems in the construction of index numbers.		
4.3 Construction of consumer price indices. Important share price indices including BSE.		
Unit V: Time Series Analysis		
5.1 Components of time series. Additive and multiplicative models.	BS	9
5.2 Trend analysis. Fitting of trend line using principle of least squares—linear, second degree parabola and exponential, moving averages.		
5.3 Seasonal variations—calculation and uses. Simple averages, ratio-to-trend, ratio-to-moving averages and link-relatives methods.		

Bundelkhand University, Jhansi (U.P.)
B.Com. (Hons.) 2015-16 Onwards
Semester IV: Business Mathematics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit I: Matrix and Determinants		
1.1 Algebra of matrices. Inverse of a matrix.	BM	1
1.2 Solution of system of linear equations (having unique solution and involving not more than three variables) using matrices. Input Output Analysis.		
Unit II: Calculus I		
2.1 Mathematical functions and their types—linear, quadratic, polynomial, exponential, Logarithmic and logistic function.	BM	2
2.2 Concept and rules of differentiation, Maxima and Minima involving second or higher order derivatives.		
Unit III: Calculus II		
3.1 Partial Differentiation. Partial derivatives up to second order, Homogeneity of functions and Euler's theorem. Total differentials—Differentiation of implicit functions with the help of total differentials.	BM	3
3.2 Maxima and Minima in cases of two variables.		
3.3 Integration Standard forms. Methods of integration—by substitution, by parts and by use of partial fractions; definite integration, finding areas in simple case.	BM	4
Unit IV: Mathematics of Finance		
4.1 Rates of interest—nominal, effective and their inter-relationships in different compounding situations.	BM	5
4.2 Compounding and discounting of a sum using different types of rates.		
4.3 Types of annuities, like ordinary, due, deferred, continuous, perpetual, and their future and present values using different types of rates of interest; Sinking funds.		
Unit V: Linear Programming		
5.1 Formulation of linear programming problems (LPP). Graphical solution to LPPs. Cases of unique and multiple optimal solutions; unbounded solutions and infeasibility, and redundant constraints.		
5.2 Solution to LPPs using Simplex method—maximization and minimization cases (only two variables).		
5.3 The dual problem. Formulation of the Dual; Economies interpretation of the duality.		

Utkal University
B.Com. (Hons.): Semester III (CBCS) (w.e.f. 2016-17)
Paper 3.4: Business Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit I: Statistical Data and Descriptive Statistics		
Nature and Classification of data: univariate, bivariate and multivariate data; time-series and cross-sectional data.	BS	1
Measures of Central Tendency		
(a) Mathematical averages including arithmetic mean, geometric mean and harmonic mean. Properties and applications.	BS	4
(b) Positional Averages		
Mode and Median (and other partition values including quartiles, deciles, and percentiles) (including graphic determination).		
Unit 2:		
Measures of Variation – Absolute and relative. Range, quartile deviation, mean deviation, standard deviation, and their coefficients, Properties of standard deviation/ variance Skewness: Meaning, Measurement using Karl Pearson and Bowley’s measures: Concept of Kurtosis.	BS	5
Probability and Probability Distributions – Theory of Probability: Approaches to the calculation of probability, Calculation of event probabilities. Addition and multiplication laws of probability (Proof not required) Conditional probability and Bayes’ Theorem (Proof not required).		
Unit 3: Simple Correlation and Regression Analysis		
Correlation Analysis: Meaning of Correlation: simple, multiple and partial; linear and non-linear, Correlation and Causation, Scatter diagram, Pearson’s coefficient of correlation; calculation and properties (proofs not required). Correlation and Probable error; Rank Correlation.	BS	6
Regression Analysis: Principle of least squares and regression lines, Regression equations and estimation; Properties of regression coefficients; Relationship between Correlation and Regression coefficients; Standard Error of Estimate.	BS	7
Unit 4: Index Numbers		
Meaning and uses of index numbers: Construction of index numbers: fixed and chain base: univariate and composite. Aggregative and average of relatives—simple and weighted.	BS	8
Tests of adequacy of index numbers, Base shifting, splicing and deflating. Problems in the construction of index numbers.		
Construction of consumer price indices, important share price indices.		
Unit 5: Time Series Analysis		
Components of time series, Additive and multiplicative models, Trend analysis, Fitting of trend line using principle of least squares—linear, second degree parabola and exponential. Conversion of annual linear trend equation to quarterly/monthly basis and vice-versa; Moving averages Seasonal variations—Calculation of Seasonal Indices using Simple averages, Ratio-to-trend, and Ratio-to-moving averages methods. Uses of Seasonal Indices.	BS	9

Kurukshetra University
B.Com. (Hons.) & B.Com. (General) 2017-18 Onwards
Paper BC 105: Business Mathematics - I

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Logarithms, Anti-logarithms.		
Sequences and Series: Arithmetic & Geometric Progressions.		
Differentiation: Idea of simple derivative of different functions (excluding trigonometrical functions); Rules of differentiation (simple standard forms)	BM	3
Maxima and Minima of functions of one variable (including 2 nd and 3 rd order derivatives) relating to cost, revenue and profit.		
Matrices and Determinants: concept of matrix, types, and algebra of matrices; properties of determinants; calculation of values of determinants up to third order, adjoint of a matrix, elementary row or column operations; Finding inverse of a matrix through adjoint and elementary row or column operations; solution of a system of linear equations having unique solution and involving not more than three variables.	BM	1
Compound Interest and Annuities: different types of interest rates, concept of present value and amount of a sum; types of annuities; present value and amount of an annuity (including the case of continuous compounding); valuation of simple loans and debentures; problems relating to sinking funds.	BM	5
Paper BC 205: Business Mathematics – II		
Permutations and Combinations.		
Binomial Theorem.		
Linear inequalities: graphical solution of linear equalities in two variables, solution of system of linear inequalities in two variables.		
Linear programming-formulation of equation: graphical method of solution; problems relating to two variables including the case of mixed constraints; cases having no solution, multiple solutions, unbounded solution and redundant constraints.		
Data representation and interpretation: introduction, classification and tabulation of data, Diagrammatic and graphic representation of data: significance of diagrams and graphs, Types of diagrams: bar diagram, pie chart, pictographs, graphs of time series or line graphs; graphs of frequency distribution: histogram, frequency polygon, ogives or cumulative frequency curves, limitations of diagrams and graphs.	BS	3

Kurukshetra University
B.Com. (Hons.) & B.Com. (General) 2017-18 Onwards

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Paper BC 302: Business Mathematics – II		
Introduction of statistics: concept, scope, usefulness & limitations of statistics, distrust of statistics. Collection of data: primary and secondary data, methods of collection of data.	BS	1
Measure of central tendency: mean, median, mode, harmonic mean and geometric mean. Measure of dispersion: range, inter-quartile range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Lorenz curve.	BS	4, 5
Index numbers: meaning, types and uses of index numbers, methods of preparation of index numbers: simple or unweighted and weighted index number, problems in the preparation of index numbers, Tests of adequacy: Chain-base index numbers: Base shifting, Splicing and deflating, Consumer price index.	BS	8
Analysis of Time Series: causes of variation in time series data; Components of a time series; Decomposition: additive and multiplicative models; determination of trend: moving averages method and method of Least Squares (including linear second degree, parabolic, and exponential trend); Computation of seasonal-indices by sample averages, ratio-to-trend, ratio-to-moving average and link relative methods.	BS	9
Paper BC 402: Business Mathematics – II		
Simple Correlation: concept, types: multiple and partial; linear and non-linear; Scatter diagram, Methods: Karl Pearson's co-efficient of correlation, Spearman's Rank Correlation, Concurrent deviation method; Probable and standard errors.	BS	6
Regression Analysis: meaning, difference between correlation and regression, regression coefficients, methods of calculation of simple regression, standard error of estimate.	BS	7
Probability: concept and approaches; addition and multiplication laws of probability; Conditional probability: Bayes' Theorem.		
Probability distributions: concept, Binomial, Poisson and Normal distributions: their properties and parameters.		

Ranchi University
B.Com. (Hons.) : Semester II (CSBS) (2017-2020)
Generic Elective (GE 2): Business Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit I: Statistical Data and Descriptive Statistics		
1.1 Measurement of central tendency (a) Mathematical average including arithmetic mean, Geometric mean and Harmonic mean. Properties and applications. (b) Positional average Mode and Median (and other partition values including quartiles, deciles and percentiles including graphic determination).	BS	1, 4
1.2 Measures of variation: Absolute and relative. Range, Quartile Deviation, Mean Deviation, Standard Deviation and their coefficient, properties of standard deviation/variation.	BS	5
1.3 Skewness: Meaning, measurement using Karl Pearson and Bowley's measure.	BS	6
Unit II: Probability		
2.1 Theory of probability, Approaches to the calculation of probability.		
2.2 Calculation of event probabilities, Addition and multiplication laws of probability (proof not required).		
2.3 Conditional probability and Bayes theorem (proof not required).		
Unit III: Simple Correlation and Regression Analysis		
3.1 Correlation analysis—Meaning of correlation: Simple, Multiple and partial, Linear and non-linear, correlation and causation, Scatter diagram, Pearson's coefficient of correlation, calculation and properties (proof not required). Correlation and probable error, Rank correlation.	BS	6
3.2 Regression analysis. Principles of least square and regression lines, Regression equation and estimation, properties of regression coefficient, relationship between correlation regression coefficient, Standard error of Estimate.	BS	7
Unit IV: Index Numbers		
4.1 Meaning and use of Index Numbers. Construction of Index Numbers: Fixed and chain base: Aggregative and average of relatives/simple and weighted.	BS	8
4.2 Tests of adequacy of Index numbers, Base shifting, splicing and deflating, Problems in the construction of Index numbers.		
4.3 Construction of consumer price indices. Important share price indices, including BSE SENSEX and NSE NIFTY.		
Unit V: Time Series Analysis		
5.1 Component of time series. Additive and multiplicative models.	BS	9
5.2 Trend analysis. Fitting of trend line using principle of least square—linear, second degree parabola and exponential. Conversion of annual linear trend equation to quarterly/monthly basis and vice versa, Moving averages.		
5.3 Seasonal variation. Calculation of seasonal indices using simple averages, ratio-to-trend, and ratio-to-moving averages methods. Using of seasonal indices. The student will be familiarized with software and the statistical and other functions contained therein related to formation of frequency distributions and calculation of averages, measures of variation, correlation and regression coefficient.		

Ranchi University
B.Com. (Hons.) : Semester III (CSBS) (2017-2020)
Core Course (C 5): Business Mathematics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit 1: Matrices and Determinants		
Meaning of Matrix, types, addition of matrices, product of matrices, inverse of matrix and solution of Simultaneous linear equation using matrix method.	BM	1
Determinants: Concept of determinants, basic properties of determinants.		
Unit 2: Progression		
Arithmetic Progression—Basic concept of A.P., finding n th term, sum up of n terms, Arithmetic mean, word problem based on A.P.		
Geometric Progression—Basic concept, finding n th term and sum of n terms, Geometric mean, Word problem based on G.P.		
Harmonic Progression—Basic concept of H.P., problem based on the relation of AM, GM and HM.		
Unit 3: Permutation and Combination		
Basic concept of permutation and combination and simple problems based on permutation and combination.		
Unit 4: Basic Mathematics of Finance		
Ratio and Proportion, Simple interest, Compound interest, annuities, discount—Banker's discount, Trade discount.	BM	5
Unit 5: Differentiation and Integration		
Differentiation and Integration of a function, Application in Business and commerce.	BM	3, 4
Unit 6: Linear Programming Problem		
Formulation of Linear Programming Problem (LPP), Graphical Solution to LPP.		

Calcutta University
B.Com. (Hons.) (CSBS) (w.e.f. 2017-18)
Paper GE 3.3 Chg : Business Mathematics and Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Module I: Business Mathematics		
1. Permutations and Combination: Definition, Factorial Notation, Theorems on Permutation, Permutations with repetitions, Restricted Permutations; Theorems on Combination, Basic identities, Restricted Combinations.		
2. Set Theory: Definition of set, Presentation of sets, Different types of sets—Null set, Finite and Infinite sets, Universal set, Subset, Power set etc. Set Operations, Law of algebra of Sets.		
3. Binomial Theorem: Statement of the theorem for positive integral index, General term, Middle term, Simple properties of binomial coefficients.		
4. Logarithm: Definition, Base and Index of Logarithm, General properties of Logarithm, Common Problems.		
5. Compound Interest and Annuities: Simple AP and GP Series, Different types of interest rates, Net present value, Types of annuities, Continuous compounding, Valuation of simple loans and debentures, Problems relating to Sinking Funds.	BM	5
Module II: Statistics		
6. Correlation and Association: Bivariate data, Scatter diagram, Pearson's correlation coefficient, Spearman's rank correlation, Measures of association of attributes.	BS	6
7. Regression Analysis: Least squares method, Simple regression lines, properties of regression, Identification of regression lines.	BS	7
8. Index Numbers: Meaning and types of index numbers, Problems of constructing index numbers, Construction of price and quantity indices. Test of adequacy, errors in index numbers, Chain base index numbers; Base shifting, Splicing, Deflating, Consumer price index and its uses.	BS	8
9. Time Series Analysis: Causes of variation in time series data, Components of time series, additive and multiplicative models, Determination of trend by semi-average, moving average and least squares (of linear, quadratic and exponential trend) methods; Computation of seasonal Indices by simple average, ratio-to-moving average, ratio-to-trend and link relative methods; Simple forecasting through time series data.	BS	9
10. Probability Theory: Meaning of probability; Different definitions of probability; Conditional probability; Compound probability; Independent events, Simple problems.		

Calcutta University
B.Com. (Pass) (CSBS) (w.e.f. 2017-18)
Paper GE 3.3 Chg : Business Mathematics and Statistics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Module I: Business Mathematics		
1. Permutation and Combination: Definition, Factorial Notation, Theorems on Permutation, Permutations with repetitions, Restricted Permutations; Theorems on Combination, Basic Identities, Restricted Combinations.		
2. Set Theory: Definition of set, Presentation of sets, Different types of sets—Null set, Finite and infinite sets, Universal set, Subset, Power set etc.; Set Operations, Law of algebra of Sets.		
3. Binomial Theorem: Statement of the theorem for positive integral index, General term, Middle term, Simple properties of binomial coefficients.		
4. Logarithm: Definition, Base and Index of Logarithm, General properties of Logarithm, common Problems.		
5. Compound Interest and Annuities: Simple AP and GP Series, Different types of interest rates, Net present value, Types of annuities, Continuous compounding, Valuation of simple loans and debentures, Problems relating to Sinking Funds.	BM	5
Module II: Statistics		
6. Correlation and Association: Bivariate data, Scatter diagram, Pearson's correlation coefficient, Spearman's rank correlation, Measures of association of attributes.	BS	6
7. Regression Analysis: Least squares method, Simple regression lines, Properties of regression, Identification of regression lines.	BS	7
8. Index Numbers: Meaning and types of index numbers, Problems of constructing index numbers, Construction of price and quantity indices, Test of adequacy, Errors in index numbers, Chain base index numbers; Base shifting, Splicing, Deflating, Consumer price index and its uses.	BS	8
9. Time Series Analysis: Causes of variation in time series data, Components of time series, Additive and multiplicative models, Determination of trend by semi-average, moving average and least squares (of linear, quadratic and exponential trend) methods; Computation of seasonal indices by simple average, Ratio-to-moving average, Ratio-to-trend and link relative methods; Simple forecasting through time series data.	BS	9
10. Probability Theory: Meaning of probability; Different definitions of probability; Conditional probability; Compound probability; Independent events, Simple problems.		

Lucknow University
B.Com. Part III
Business Mathematics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit I		
Calculus: (Problem and theorems involving trigonometrically ratios are not be done); Total differentials. Maxima and minima cases of one variable involving second or higher order; cases of two variables involving not more than one constraint, Iteration as anti-derivate process, standard form, Methods of regration by substitutio, by parts, and by user of partial functions; Definite regration; Fibding areas in simple cases.	BM	3, 4
Unit II		
Matrices and Determinants: Definition of a matrix, Types of matrices, Properties of determinats calculation of values of determinats up to Third order, Adjoint a matrix, elementary row or colum operationa, Finding inverse of a matrix through adjoint and elementary row and column operations;Solution of a system of linear equtions having unique solution and involving not more than three variables.	BM	1
Unit III		
Linear Programming– Formulation of LLP: Graphical method of solution, Problems relating to two variables including the cases of mixed constraints simplex Method–solution of problem up to three variables, Duality, Transporation Problem.		
Unit IV		
Compound interest and annuities certain, different types of interest rates; concept of present value and amount of a sum Equation of payments, types of annuities; present values and amount of an annuity, including the cases of continous compounding; analysis of annuity valuation of simple loans and debentures, problem relating to sinking funds	BM	5
B.Com., Part III Applied and Business Statistics		
Unit I		
Statistical Syste, in India: Indian Statistical Machinery organisation at Central Statee level, Nation Sample Survey Design and Technique. Agricultural statistical in India–Nature of crop estimates, estimation of Area and yield, Industrial Statistics, Annual Survey of Industries statistics of Prices, Wage Trade and Transport.		
Unit II		
Population Statistics: Vital statistics, compulation of birth, death and survival rates. Method of population projection Population census in India.		
Unit III		
Analysis of Time Series: Trend Measurement Different Method of computing seasonal Indices, Cyclical and Irregular. Fluctuations.	BS	9
Unit IV		
National Income Statistics: Methods of Measuring National Income and Related Aggregates, Statistical Quality control construction and uses of control charts, Business forecasting Tools and Methods; Pareto and Lorenz curve, Construction of Life Tables.		

Pune University
F.Y. B.Com.
Mathematics and Statistics (Business)

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
First Term		
Unit 1		
Interest		
Simple Interest, compound interest (Nominal and effective rate of interest), Equated Monthly Installments (EMI) (Reducing balance & Flat Interest rate of interest), Problems.	BM	5
Unit 2		
Shares and Dividends		
Concept of Shares, Stock exchange, Face Value, Market Value, Dividend, Equity Shares, Preferential Shares, Bonus Shares, Examples.		
Unit 3		
Derivative of a Function		
Set, Cartesian Product, Relation.		
Function: Constant, Identity, linear step, Increasing, Decreasing, Algebraic, Exponential and logarithmic.		
Graph: Graph of standard Functions including e^x , $\log x$ & x^2 .		
Concept and Simple problems on limit, Continuity and derivative of a function, Algebra of derivative, Business Applications.		
Unit 4		
Population and Sample		
Definition of Statistics, Scope of Statistics in Economics, Management Sciences and Industry.	BS	1
Concept of population and sample with illustration. Methods of Sampling—SRSWR, SRSWOR, Stratified, Systematic (Description of sampling procedures only).		
Unit 5		
Measures of Central Tendency		
Frequency distribution: Raw data, attributes and variables, Classification of data, frequency distribution, cumulative frequency distribution, Histogram & Ogive curves.	BS	4
Concept of central tendency, Desirable Properties for good measures of central tendency. Measures of central tendency: Arithmetic mean, median and mode for grouped and ungrouped data, Combined mean for two groups.		
Appropriate choice of measures.		

Pune University
B.Com.
Mathematics and Statistics (Business) Second Term

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit 1		
Matrices and Determinants (upto order 3 only)		
Multivariable data, Definition of a Matrix, Types of Matrices, Algebra of Matrices, Determinants, Adjoint of a Matrix, Inverse of a Matrix via adjoint Matrix, Homogeneous System of Linear equations, Condition for Consistency of homogeneous system, Solution of Non-homogeneous System of Linear equations (not more than three variables). Condition for existence and uniqueness of solution, Solution using inverse of the coefficient matrix, Problems.	BM	1
Unit 2		
Linear Programming Problems (L.P.P.) (for two variables only)		
Definition and terms in a L.P.P., Formulation of L.P.P., Solution by graphical method, Problems.		
Unit 3		
Measures of Dispersion		
Concept of dispersion. Measures of dispersion: Range, Variance, Standard deviation (S.D.) for grouped and ungrouped data, combined S.D. Measures of relative dispersion: coefficient of range, coefficient of variation.	BM	4
Unit 4		
Correlation and Regression		
Concept and types of correlation. Scatter diagram, Interpretation with respect to magnitude and direction of relationship.	BS	6
Karl Pearson's coefficient of correlation for ungrouped data. Spearman's rank correlation coefficient.		
Concept of regression. Lines of regression for ungrouped data, predictions using lines of regression. Regression coefficients and their properties.	BS	7
Unit 5		
Index Numbers		
Concept of index number, price index number, price relatives. Problems in construction of index number. Construction of price index number: Weighted index number, Laspeyre's, Paasche's and Fishers method. Cost of living/consumer price index number: Definition and problems in construction, method of construction: family budget and aggregate expenditure. Inflation. Uses of index numbers, commonly used index numbers.	BS	8

MJP Rohilkhand University
B.Com. (Hons.)
Group D Paper II : Business Mathematics

<i>Course Contents</i>	<i>Section of the Book</i>	<i>Chapter of the Book</i>
Unit I		
Simple and compound interest and annuities, concepts of present values, valuation of simple loan and debentures. Problems relating to sinking funds, ratio and proportions. Percentage its application in calculating cost and invoice price, manager's commission, discount, commission and brokerage profit and loss.	BM	5
Unit II		
Algebra: Law of indices. Linear and quadratic equations, the regression (AP, GP and HP) elementary permutations and combinations.		
Unit III		
Matrices and Determinants: Definition of a matrix, types of matrices, algebra of matrices, properties of determinants, calculation of values of determinants up to third order, adjoint and inverse matrices solution of a system of linear equations having unique solution and involving not more than three variables.	BM	1
Unit IV		
Probability: Simple problems based on addition and multiplication theorems. Simple problems relating to managerial decisions based on Baye's Theorem. Simple problem of Maxima and Minima—Integration meaning, standard forms, methods of integration of substitution, by parts and by partial fractions definite integration.	BM	4
Unit V		
Linear Programming: Graphical method of solution problems relating to two variables including the case of mixed constraints simplex method—solution of problems up to two variables.		

About the Book

This text book covers complete syllabus in Business Mathematics & Business Statistics paper of B.Com. students of Delhi University. Book has been designed strictly according with the latest updated syllabus prescribed by University of Delhi. Besides revising and simplifying the text, a number of illustrations and examples are added to explain various concepts introduced in the text. Also, new problems mostly from recent university examinations have been added in this edition. At the same time old stereotype problems have been removed. In fact the whole book has been rewritten and given a new look altogether.

Salient Features

- Book covers complete syllabus in Business Mathematics & Business Statistics paper of B.Com. examination.
- There are detailed self-contained chapters on all the syllabus elements.
- Part I of the book starts with the introduction to Statistics and discusses measures of central tendency and of variation, correlation & regression analysis, index numbers, time series and interpretation of data.
- Part II of the book begins with introducing the concept of matrices and determinants. Their applications to business and economic problems are discussed in this chapter.
- Concept of differentiation & integration along with their applications are given in chapters 3 & 4 of part II.
- The language used in text is simple and the subject matter has been presented in a lucid and straightforward style.
- Special care has been taken to develop the concepts in an easy to understand manner and are self explanatory.
- The book does not require any previous knowledge of the subject.

About the Authors

Dr. S P Gupta (born 1942) has a brilliant academic record of teaching more than 4 decades in Indian and Foreign Universities. He was a student of Shri Ram College of Commerce, University of Delhi. He obtained B.Com. (H) and M.Com. Degree with "Advanced Statistics" as specialization and taught for more than a decade in SRCC.

He was invited by the Tribhuvan University, Kathmandu, Nepal as visiting professor for a period of 2 years. He was also appointed visiting Professor in Karl Marx University, Milano for a period of 1 year. He attended prestigious International Teachers Program in Stockholm (Sweden) and Budapest, Hungary.

Dr. Gupta joined Faculty of Management Studies (FMS), University of Delhi from where he obtained Ph.D degree in Management and taught for about 3 decades. He has authored more than a dozen books in the field of Statistics for B.Com., M.Com., MBA, CA, ICWA courses etc. He was also Head & Dean, Faculty of Management Studies, University of Delhi for a period of 3 years.



Dr. P K Gupta has over three decades of experience in teaching Mathematics and Operations Research to undergraduate and Post-Graduate students. He obtained a master's degree in Mathematics, and another one in Operations Research from the University of Delhi. He obtained his doctorate in 1977 in the field of Queuing Theory.

He served as a faculty member in various capacities at the Department of Mathematics, J.V. Jain College, Saharanpur; where he taught a range of topics on Mathematics and Operations Research. These included Boolean Algebra, Linear Algebra, Difference Equations, Graph Theory and Techniques of Operations Research.

In 1979, he was invited by the Cochin University of Science & Technology, Kochi (Kerala) to teach the students of their new diploma course in Operations Research and Computer Applications. He also has been actively engaged in research in the discipline. He supervised multiple Ph.D scholars in

Optimization of Queues and also applied optimization techniques in paper industry. He has authored more than half a dozen books of Mathematics and Operations Research, in addition to multiple research publications.



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